

EXHIBIT H

We will never have a perfect model of risk

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The current financial crisis in the US is likely to be judged in retrospect as the most wrenching since the end of the second world war. It will end eventually when home prices stabilise and with them the value of equity in homes supporting troubled mortgage securities.

Home price stabilisation will restore much-needed clarity to the marketplace because losses will be realised rather than prospective. The major source of contagion will be removed. Financial institutions will then recapitalise or go out of business. Trust in the solvency of remaining counterparties will be gradually restored and issuance of loans and securities will slowly return to normal. Although inventories of vacant single-family homes – those belonging to builders and investors – have recently peaked, until liquidation of these inventories proceeds in earnest, the level at which home prices will stabilise remains problematic.

The American housing bubble peaked in early 2006, followed by an abrupt and rapid retreat over the past two years. Since summer 2006, hundreds of thousands of homeowners, many forced by foreclosure, have moved out of single-family homes into rental housing, creating an excess of approximately 600,000 vacant, largely investor-owned single-family units for sale. Homebuilders caught by the market's rapid contraction have involuntarily added an additional 200,000 newly built homes to the "empty-house-for-sale" market.

Home prices have been receding rapidly under the weight of this inventory overhang. Single-family housing starts have declined by 60 per cent since early 2006, but have only recently fallen below single-family home demand. Indeed, this sharply lower level of pending housing additions, together with the expected 1m increase in the number of US households this year as well as underlying demand for second homes and replacement homes, together imply a decline in the stock of vacant single-family homes for sale of approximately 400,000 over the course of 2008.

The pace of liquidation is likely to pick up even more as new-home construction falls further. The level of home prices will probably stabilise as soon as the rate of inventory liquidation reaches its maximum, well before the ultimate elimination of inventory excess. That point, however, is still an indeterminate number of months in the future.

The crisis will leave many casualties. Particularly hard hit will be much of today's financial risk-valuation system, significant parts of which failed under stress. Those of us who look to the self-interest of lending institutions to protect shareholder equity have to be in a state of shocked disbelief. But I hope that one of the casualties will not be reliance on counterparty surveillance, and more generally financial self-regulation, as the fundamental balance mechanism for global finance.

The problems, at least in the early stages of this crisis, were most pronounced among banks whose regulatory oversight has been elaborate for years. To be sure, the systems of setting bank capital requirements, both economic and regulatory, which have developed over the past two decades will be overhauled substantially in light of recent experience. Indeed, private investors are already demanding larger capital buffers and collateral, and the mavens convened under the auspices of the Bank for International Settlements will surely amend the newly minted Basel II international regulatory accord. Also being questioned, tangentially, are the mathematically elegant economic forecasting models that once again have been unable to anticipate a financial crisis or the onset of recession.

Credit market systems and their degree of leverage and liquidity are rooted in trust in the solvency of counterparties. That trust was badly shaken on August 9 2007 when **BNP Paribas revealed** large unanticipated losses on US subprime securities. Risk management systems – and the models at their core – were supposed to guard against outsized losses. How did we go so wrong?

The essential problem is that our models – both risk models and econometric models – as complex as they have become, are still too simple to capture the full array of governing variables that drive global economic reality. A model, of necessity, is an abstraction from the full detail of the real world. In line with the time-honoured observation that diversification lowers risk, computers crunched reams of historical data in quest of negative correlations between prices of tradeable assets; correlations that could help insulate investment portfolios from the broad swings in an economy. When such asset prices, rather than offsetting each other's movements, fell in unison on and following August 9 last year, huge losses across virtually all risk-asset classes ensued.

The most credible explanation of why risk management based on state-of-the-art statistical models can perform so poorly is that the underlying data used to estimate a model's structure are drawn generally from both periods of euphoria and periods of fear, that is, from regimes with importantly different dynamics.

The contraction phase of credit and business cycles, driven by fear, have historically been far shorter and far more abrupt than the expansion phase, which is driven by a slow but cumulative build-up of euphoria. Over the past half-century, the American economy was in contraction only one-seventh of the time. But it is the onset of that one-seventh for which risk management must be most prepared. Negative correlations among asset classes, so evident during an expansion, can collapse as all asset prices fall together, undermining the strategy of improving risk/reward trade-offs through diversification.

If we could adequately model each phase of the cycle separately and divine the signals that tell us when the shift in regimes is about to occur, risk management systems would be improved significantly. One difficult problem is that much of the dubious financial-market behaviour that chronically emerges during the expansion phase is the result not of ignorance of badly underpriced risk, but of the concern that unless firms participate in a current euphoria, they will irretrievably lose market share.

Risk management seeks to maximise risk-adjusted rates of return on equity; often, in the process, underused capital is considered "waste". Gone are the days when banks prided themselves on triple-A ratings and sometimes hinted at hidden balance-sheet reserves (often true) that conveyed an aura of invulnerability. Today, or at least prior to August 9 2007, the assets and capital that define triple-A status, or seemed to, entailed too high a competitive cost.

I do not say that the current systems of risk management or econometric forecasting are not in large measure soundly rooted in the real world. The exploration of the benefits of diversification in risk-management models is unquestionably sound and the use of an elaborate macroeconomic model does enforce forecasting discipline. It requires, for example, that saving equal investment, that the marginal propensity to consume be positive, and that inventories be non-negative. These restraints, among others, eliminated most of the distressing inconsistencies of the unsophisticated forecasting world of a half century ago.

But these models do not fully capture what I believe has been, to date, only a peripheral addendum to business-cycle and financial modelling – the innate human responses that result in swings between euphoria and fear that repeat themselves generation after generation with little evidence of a learning curve. Asset-price bubbles build and burst today as they have since the early 18th century, when modern competitive markets evolved. To be sure, we tend to label such behavioural responses as non-rational. But forecasters' concerns should be not whether human response is rational or irrational, only that it is observable and systematic.

This, to me, is the large missing “explanatory variable” in both risk-management and macroeconomic models. Current practice is to introduce notions of “animal spirits”, as John Maynard Keynes put it, through “add factors”. That is, we arbitrarily change the outcome of our model's equations. Add-factoring, however, is an implicit recognition that models, as we currently employ them, are structurally deficient; it does not sufficiently address the problem of the missing variable.

We will never be able to anticipate all discontinuities in financial markets. Discontinuities are, of necessity, a surprise. Anticipated events are arbitrated away. But if, as I strongly suspect, periods of euphoria are very difficult to suppress as they build, they will not collapse until the speculative fever breaks on its own. Paradoxically, to the extent risk management succeeds in identifying such episodes, it can prolong and enlarge the period of euphoria. But risk management can never reach perfection. It will eventually fail and a disturbing reality will be laid bare, prompting an unexpected and sharp discontinuous response.

In the current crisis, as in past crises, we can learn much, and policy in the future will be informed by these lessons. But we cannot hope to anticipate the specifics of future crises with any degree of confidence. Thus it is important, indeed crucial, that any reforms in, and adjustments to, the structure of markets and regulation not inhibit our most reliable and effective safeguards against cumulative economic failure: market flexibility and open competition.

The writer is former chairman of the US Federal Reserve and author of 'The Age of Turbulence: Adventures in a New World'

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